

Remarks

The Office Action mailed September 29, 2005 has been carefully reviewed and the following remarks have been made in consequence thereof.

Claims 1-31 are now pending in this application. Claims 1-31 are rejected. Claims 1, 12, and 22 have been amended. No new matter has been added.

The rejection of Claims 1-31 under 35 U.S.C §112, second paragraph, is respectfully traversed. The Office Action states on page 2 that the terminology "wherein each set of received echoes that corresponds to a single transmitted wave defines a steering frame" is indefinite because the specification does not clearly redefine the term. Applicant respectfully traverses the statement on page 2 of the Office Action.

Applicant submits that one skilled in the art would understand independent Claims 1, 12, and 22. Applicant respectfully submits that one skilled in the art, after reading the specification in light of the figures, would understand Claims 1, 12, and 22. Specifically, the specification describes, for example, in paragraph 25, "[e]ach set of received echoes that corresponds to a single transmitted wave defines a steering frame". The specification, also describes, for example, in paragraph 17, "Array transducer 106 may include any number of transducer elements 104. Each wave 302 is projected into a volume of interest 304 that may contain an object of interest 306 and may overlap one or more of waves 302 emanating from adjacent transducer elements 104. Object 306 may absorb, transmit, refract and/or reflect waves 302 that impact object 306. Reflected waves or echoes from object 306 are received by transducer elements 104 and processed by system 100 to create image or steering frames indicative of the object 306 and other objects within volume 304."

Accordingly, the specification describes, for example, that each wave 302 is projected into a volume of interest 304 that may contain an object of interest 306, that object 306 may absorb, transmit, refract and/or reflect waves 302 that impact object 306, and that reflected echoes from object 306 are received by transducer elements 104 and processed by system 100 to create image or steering frames, and that each set of received echoes that corresponds to a single transmitted wave defines a steering frame. As such, "each set of received echoes that corresponds to a single transmitted

wave defines a steering frame” as recited in Claims 1, 12, and 22, is definite. Accordingly, Applicant respectfully submits that Claims 1, 12, and 22 particularly point out and distinctly claim the subject matter the Applicant regards as the invention. Hence, Applicant respectfully submits that Claims 1, 12, and 22 satisfy Section 112, second paragraph.

Claims 2-11 depend, directly or indirectly, from independent Claim 1, Claims 13-21 depend, directly or indirectly, from independent Claim 12, and Claims 23-31 depend, directly or indirectly, from independent Claim 22. Accordingly, Applicant respectfully submits that Claims 1-31 satisfy Section 112, second paragraph and respectfully request that the section 112 rejection of Claims 1-31 be withdrawn.

The rejection of Claims 1-31 under 35 U.S.C §112, first paragraph, is respectfully traversed. Applicant respectfully traverse a statement on pages 4-5 of the Office Action. The statement states, “under at least some interpretations the claims pertain to compounding based on echo data sets which are themselves volumetric at each stationary array position...Hence adaptive compounding of volume subsets is apparently being invoked however no indication of how to perform volumetric compounding is provided, and as noted above, broadbeam or MLA volume subset techniques yield unconventional subvolume units which would be the unit inputs to such as process yet not description is provided as to how this circumstance is accommodated.” Applicant respectively traverses the statement on pages 4-5 of the Office Action.

Applicant respectfully submits that Claims 1, 12, and 22 satisfy Section 112, first paragraph. Applicant respectfully submits that one skilled in the art, after reading the specification in light of the figures, would be able to make and/or use the invention as described in Claims 1, 12, and 22. Specifically, as an example, the specification, in paragraph 25, states, “[e]ach set of received echoes that corresponds to a single transmitted wave defines a steering frame”. Moreover, as another example, the specification, in paragraph 17, states, “Array transducer 106 may include any number of transducer elements 104. Each wave 302 is projected into a volume of interest 304 that may contain an object of interest 306 and may overlap one or more of waves 302 emanating from adjacent transducer elements 104. Object 306 may absorb, transmit, refract and/or reflect waves 302 that impact object 306. Reflected

waves or echoes from object 306 are received by transducer elements 104 and processed by system 100 to create image or steering frames indicative of the object 306 and other objects within volume 304.” Accordingly, the specification describes, for example, that each wave 302 is projected into a volume of interest 304 that may contain an object of interest 306, that object 306 may absorb, transmit, refract and/or reflect waves 302 that impact object 306, and that reflected echoes from object 306 are received by transducer elements 104 and processed by system 100 to create image or steering frames, and that each set of received echoes that corresponds to a single transmitted wave defines a steering frame. Hence, the specification provides an example of “each set of received echoes that corresponds to a single transmitted wave defines a steering frame” as recited in Claims 1, 12, and 22. As such, Claims 1, 12, and 22 satisfy Section 112, first paragraph. Accordingly, Applicant respectfully requests that the rejection of Claims 1, 12, and 22 under Section 112, first paragraph, be withdrawn.

Claims 2-11 depend, directly or indirectly, from independent Claim 1, Claims 13-21 depend, directly or indirectly, from independent Claim 12, and Claims 23-31 depend, directly or indirectly, from independent Claim 22. Accordingly, Applicant respectfully submits that Claims 1-31 satisfy Section 112, first paragraph and respectfully request that the section 112 rejection of Claims 1-31 be withdrawn.

The rejection of Claims 1-5, 8-15, 18-25, and 28-31 under 35 U.S.C. § 102(e) as being anticipated by Hossack et al. (U.S. Patent No. 6,641,536) is respectfully traversed.

Hossack et al. describe an ultrasound diagnostic imaging method. The method includes eliminating a component image in response to an estimated motion of successive images (column 16, lines 15-17). If a next component image is associated with a small amount of transducer movement, the component image is eliminated (column 16, lines 17-20). In the method, a frequency selection of possible component images within a sequence adapts as a function of estimated motion (column 22, lines 26-28). For example, every other or every third possible component image is selected where the amount of motion is low (column 22, lines 28-30).

Claim 1 recites a method of medical ultrasound imaging using a medical ultrasound imaging system that includes an array transducer, the method comprising “transmitting ultrasound waves into a volume at a first rate; receiving ultrasound echoes for each of the ultrasound waves wherein each set of received echoes that corresponds to a single transmitted wave defines a steering frame; detecting motion of the array transducer; combining a plurality of steering frames into a compound image based on the motion of the array transducer; and determining, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image.”

Hossack et al. do not describe or suggest a method of medical ultrasound imaging as recited in Claim 1. Specifically, Hossack et al. do not describe or suggest determining, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Accordingly, Hossack et al. do not describe or suggest determining, based on the motion of the array transducer, a delay period as recited in Claim 1. For the reasons set forth above, Claim 1 is submitted to be patentable over Hossack et al.

Claims 2-5 and 8-11 depend, directly or indirectly, from independent Claim 1. When the recitations of Claims 2-5 and 8-11 are considered in combination with the recitations of Claim 1, Applicant submits that Claims 2-5 and 8-11 likewise are patentable over Hossack et al.

Claim 12 recites a medical ultrasound system, comprising “an array transducer transmitting and receiving ultrasound signals for transmitting ultrasound waves into a volume at different steering angles; a receiver for receiving signals from said transducer indicative of ultrasound echoes for each of said ultrasound waves, each set of received echoes that corresponds to a single transmitted wave defining a steering frame; a signal processor detecting motion of the array transducer and combining said steering frames into a compound image based on the detected array transducer motion; and a display for outputting information based on said compound images,

wherein said ultrasound system configured to determine, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image.”

Hossack et al. do not describe or suggest a medical ultrasound system as recited in Claim 12. Specifically, Hossack et al. do not describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Accordingly, Hossack et al. do not describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period as recited in Claim 12. For the reasons set forth above, Claim 12 is submitted to be patentable over Hossack et al.

Claims 13-15 and 18-21 depend, directly or indirectly, from independent Claim 12. When the recitations of Claims 13-15 and 18-21 are considered in combination with the recitations of Claim 12, Applicant submits that Claims 13-15 and 18-21 likewise are patentable over Hossack et al.

Claim 22 recites a computer program embodied on a computer readable medium for controlling medical ultrasound imaging comprising a code segment that receives user selection input data and then “transmits ultrasound waves into a volume at different steering angles; receives ultrasound echoes for each of the ultrasound waves, each set of received echoes that corresponds to a single transmitted wave defining a steering frame; detects motion of the array transducer; combines a plurality of steering frames into a compound image based on the detected array transducer motion; and determines, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image.”

Hossack et al. do not describe or suggest a computer program as recited in Claim 22. Specifically, Hossack et al. do not describe or suggest a computer program including a code segment that determines, based on the motion of the array

transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Accordingly, Hossack et al. do not describe or suggest a code segment that determines, based on the motion of the array transducer, a delay period as recited in Claim 22. For the reasons set forth above, Claim 22 is submitted to be patentable over Hossack et al.

Claims 23-25 and 28-31 depend, directly or indirectly, from independent Claim 22. When the recitations of Claims 23-25 and 28-31 are considered in combination with the recitations of Claim 22, Applicant submits that Claims 23-25 and 28-31 likewise are patentable over Hossack et al.

For at least the reasons set forth above, Applicant respectfully requests that the Section 102 rejection of Claims 1-5, 8-15, 18-25, and 28-31 be withdrawn.

The rejection of Claims 1-5, 8-15, 18-25, and 28-31 under 35 U.S.C. § 103(a) as being unpatentable over Hossack et al. in view of Robinson et al. (U.S. Patent 6,210,328) is respectfully traversed.

Hossack et al. is described above. Robinson et al. describe a method including acquiring a number of lines. When the number of lines simultaneously acquired is increased by increasing multiline acquisition, a number of look directions can be increased (column 6, lines 56-60).

Claim 1 is recited above. Neither Hossack et al. nor Robinson et al., considered alone or in combination, describe or suggest a method of medical ultrasound imaging as recited in Claim 1. Specifically, neither Hossack et al. nor Robinson et al., considered alone or in combination, describe or suggest determining, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion.

Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Accordingly, neither Hossack et al. nor Robinson et al., considered alone or in combination, describe or suggest determining, based on the motion of the array transducer, a delay period as recited in Claim 1. For the reasons set forth above, Claim 1 is submitted to be patentable over Hossack et al. in view of Robinson et al.

Claims 2-5 and 8-11 depend, directly or indirectly, from independent Claim 1. When the recitations of Claims 2-5 and 8-11 are considered in combination with the recitations of Claim 1, Applicant submits that Claims 2-5 and 8-11 likewise are patentable over Hossack et al. in view of Robinson et al.

Claim 12 is recited above. Neither Hossack et al. nor Robinson et al., considered alone or in combination, describe or suggest a medical ultrasound system as recited in Claim 12. Specifically, neither Hossack et al. nor Robinson et al., considered alone or in combination, describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Accordingly, neither Hossack et al. nor Robinson et al., considered alone or in combination, describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period as recited in Claim 12. For the reasons set forth above, Claim 12 is submitted to be patentable over Hossack et al. in view of Robinson et al.

Claims 13-15 and 18-21 depend, directly or indirectly, from independent Claim 12. When the recitations of Claims 13-15 and 18-21 are considered in combination with the recitations of Claim 12, Applicant submits that Claims 13-15 and 18-21 likewise are patentable over Hossack et al. in view of Robinson et al.

Claim 22 is recited above. Neither Hossack et al. nor Robinson et al., considered alone or in combination, describe or suggest a computer program as recited in Claim 22. Specifically, neither Hossack et al. nor Robinson et al., considered alone or in combination, describe or suggest a computer program including a code segment that determines, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Accordingly, neither Hossack et al. nor Robinson et al., considered alone or in combination, describe or suggest a code segment that determines, based on the motion of the array transducer, a delay period as recited in Claim 22. For the reasons set forth above, Claim 22 is submitted to be patentable over Hossack et al. in view of Robinson et al.

Claims 23-25 and 28-31 depend, directly or indirectly, from independent Claim 22. When the recitations of Claims 23-25 and 28-31 are considered in combination with the recitations of Claim 22, Applicant submits that Claims 23-25 and 28-31 likewise are patentable over Hossack et al. in view of Robinson et al.

For at least the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 1-5, 8-15, 18-25, and 28-31 be withdrawn.

The rejection of Claims 6, 16, and 26 under 35 U.S.C. § 103(a) as being unpatentable over Hossack et al. is respectfully traversed.

Claim 6 depends indirectly from independent Claim 1 which is recited above. Hossack et al. do not describe or suggest a method of medical ultrasound imaging as recited in Claim 1. Specifically, Hossack et al. do not describe or suggest determining, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a

frequency selection of possible component images within a sequence as a function of estimated motion. Accordingly, Hossack et al. do not describe or suggest determining, based on the motion of the array transducer, a delay period as recited in Claim 1. For the reasons set forth above, Claim 1 is submitted to be patentable over Hossack et al.

When the recitations of Claim 6 are considered in combination with the recitations of Claim 1, Applicant submits that Claim 6 likewise is patentable over Hossack et al.

Claim 16 depends indirectly from independent Claim 12 which is recited above. Hossack et al. do not describe or suggest a medical ultrasound system as recited in Claim 12. Specifically, Hossack et al. do not describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Accordingly, Hossack et al. do not describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period as recited in Claim 12. For the reasons set forth above, Claim 12 is submitted to be patentable over Hossack et al.

When the recitations of Claim 16 are considered in combination with the recitations of Claim 12, Applicant submits that Claim 16 likewise is patentable over Hossack et al.

Claim 26 depends indirectly from independent Claim 22 which is recited above. Hossack et al. do not describe or suggest a computer program as recited in Claim 22. Specifically, Hossack et al. do not describe or suggest a computer program including a code segment that determines, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images

within a sequence as a function of estimated motion. Accordingly, Hossack et al. do not describe or suggest a code segment that determines, based on the motion of the array transducer, a delay period as recited in Claim 22. For the reasons set forth above, Claim 22 is submitted to be patentable over Hossack et al.

When the recitations of Claim 26 are considered in combination with the recitations of Claim 22, Applicant submits that Claim 26 likewise is patentable over Hossack et al.

For at least the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 6, 16, and 26 be withdrawn.

The rejection of Claims 6, 16, and 26 under 35 U.S.C. § 103(a) as being unpatentable over Hossack et al. and further in view of Robinson et al., and further in view of Weng (U.S. Patent No. 5,566,674) is respectfully traversed.

Hossack and Robinson et al. are described above.

Weng describes a method for reducing ultrasound image shadowing and speckle. In the method, a plurality of final local motion vectors are applied to a least-squares (L-S) process in order to estimate global image motion (column 3, lines 27-29). Based on the global image motion information, a current image frame is transformed geometrically to coincide with a previously compounded image frame (column 3, lines 29-32).

Claim 6 depends indirectly from independent Claim 1 which is recited above. None of Hossack et al., Robinson et al, or Weng, considered alone or in combination, describe or suggest a method of medical ultrasound imaging as recited in Claim 1. Specifically, none of Hossack et al., Robinson et al, or Weng, considered alone or in combination, describe or suggest determining, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously

acquired is increased. Weng describes applying a plurality of final local motion vectors to a least-squares process to estimate global image motion. Based on the global image motion information, a current image frame is transformed geometrically to coincide with a previously compounded image frame. Accordingly, none of Hossack et al., Robinson et al., or Weng, considered alone or in combination, describe or suggest determining, based on the motion of the array transducer, a delay period as recited in Claim 1. For the reasons set forth above, Claim 1 is submitted to be patentable over Hossack et al. in view of Robinson et al., and further in view of Weng.

When the recitations of Claim 6 are considered in combination with the recitations of Claim 1, Applicant submits that Claim 6 likewise is patentable over Hossack et al. in view of Robinson et al., and further in view of Weng.

Claim 16 depends indirectly from independent Claim 12 which is recited above. None of Hossack et al., Robinson et al., or Weng, considered alone or in combination, describe or suggest a medical ultrasound system as recited in Claim 12. Specifically, none of Hossack et al., Robinson et al., or Weng, considered alone or in combination, describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Weng describes applying a plurality of final local motion vectors to a least-squares process to estimate global image motion. Based on the global image motion information, a current image frame is transformed geometrically to coincide with a previously compounded image frame. Accordingly, none of Hossack et al., Robinson et al., or Weng, considered alone or in combination, describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period as recited in Claim 12. For the reasons set forth above, Claim 12 is submitted to be patentable over Hossack et al. in view of Robinson et al., and further in view of Weng.

When the recitations of Claim 16 are considered in combination with the recitations of Claim 12, Applicant submits that Claim 16 likewise is patentable over Hossack et al. in view of Robinson et al., and further in view of Weng.

Claim 26 depends indirectly from independent Claim 22 which is recited above. None of Hossack et al., Robinson et al., or Weng, considered alone or in combination, describe or suggest a computer program as recited in Claim 22. Specifically, none of Hossack et al., Robinson et al., or Weng, considered alone or in combination, describe or suggest a computer program including a code segment that determines, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Weng describes applying a plurality of final local motion vectors to a least-squares process to estimate global image motion. Based on the global image motion information, a current image frame is transformed geometrically to coincide with a previously compounded image frame. Accordingly, none of Hossack et al., Robinson et al., or Weng, considered alone or in combination, describe or suggest a code segment that determines, based on the motion of the array transducer, a delay period as recited in Claim 22. For the reasons set forth above, Claim 22 is submitted to be patentable over Hossack et al. in view of Robinson et al., and further in view of Weng.

When the recitations of Claim 26 are considered in combination with the recitations of Claim 22, Applicant submits that Claim 26 likewise is patentable over Hossack et al. in view of Robinson et al., and further in view of Weng.

For at least the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 6, 16, and 26 be withdrawn.

The rejection of Claims 7, 17, and 27 under 35 U.S.C. § 103(a) as being unpatentable over Hossack et al. is respectfully traversed.

Claim 7 depends indirectly from independent Claim 1 which is recited above. Hossack et al. do not describe or suggest a method of medical ultrasound imaging as recited in Claim 1. Specifically, Hossack et al. do not describe or suggest determining, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Accordingly, Hossack et al. do not describe or suggest determining, based on the motion of the array transducer, a delay period as recited in Claim 1. For the reasons set forth above, Claim 1 is submitted to be patentable over Hossack et al.

When the recitations of Claim 7 are considered in combination with the recitations of Claim 1, Applicant submits that Claim 7 likewise is patentable over Hossack et al.

Claim 17 depends indirectly from independent Claim 12 which is recited above. Hossack et al. do not describe or suggest a medical ultrasound system as recited in Claim 12. Specifically, Hossack et al. do not describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Accordingly, Hossack et al. do not describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period as recited in Claim 12. For the reasons set forth above, Claim 12 is submitted to be patentable over Hossack et al.

When the recitations of Claim 17 are considered in combination with the recitations of Claim 12, Applicant submits that Claim 17 likewise is patentable over Hossack et al.

Claim 27 depends indirectly from independent Claim 22 which is recited above. Hossack et al. do not describe or suggest a computer program as recited in Claim 22. Specifically, Hossack et al. do not describe or suggest a computer program including a code segment that determines, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Accordingly, Hossack et al. do not describe or suggest a code segment that determines, based on the motion of the array transducer, a delay period as recited in Claim 22. For the reasons set forth above, Claim 22 is submitted to be patentable over Hossack et al.

When the recitations of Claim 27 are considered in combination with the recitations of Claim 22, Applicant submits that Claim 27 likewise is patentable over Hossack et al.

For at least the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 7, 17, and 27 be withdrawn.

The rejection of Claims 7, 17, and 27 under 35 U.S.C. § 103(a) as being unpatentable over Hossack et al. and further in view of Robinson et al., and further in view of Li et al. (U.S. Patent Application Publication 2005/0075569) is respectfully traversed.

Hossack and Robinson et al. are described above.

Li et al. describe a motion adaptive frame averaging method. The method includes calculating motion factor from a plurality of b-mode image frames by comparing at least one current b-mode frame with at least one previous b-mode frame (paragraph 30).

Claim 7 depends indirectly from independent Claim 1 which is recited above. None of Hossack et al., Robinson et al., or Li et al., considered alone or in combination, describe or suggest a method of medical ultrasound imaging as recited in Claim 1. Specifically, none of Hossack et al., Robinson et al., or Li et al.,

considered alone or in combination, describe or suggest determining, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Li et al. describe calculating motion factor by comparing at least one current b-mode frame with at least one previous b-mode frame. Accordingly, none of Hossack et al., Robinson et al., or Li et al., considered alone or in combination, describe or suggest determining, based on the motion of the array transducer, a delay period as recited in Claim 1. For the reasons set forth above, Claim 1 is submitted to be patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al.

When the recitations of Claim 7 are considered in combination with the recitations of Claim 1, Applicant submits that Claim 7 likewise is patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al.

Claim 17 depends indirectly from independent Claim 12 which is recited above. None of Hossack et al., Robinson et al., or Li et al., considered alone or in combination, describe or suggest a medical ultrasound system as recited in Claim 12. Specifically, none of Hossack et al., Robinson et al., or Li et al., considered alone or in combination, describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Li et al. describe calculating motion factor by comparing at least one current b-mode frame with at least one previous b-mode frame. Accordingly, none of Hossack et al., Robinson et al., or Li et al., considered alone or in combination, describe or suggest the ultrasound system configured to

determine, based on the motion of the array transducer, a delay period as recited in Claim 12. For the reasons set forth above, Claim 12 is submitted to be patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al.

When the recitations of Claim 17 are considered in combination with the recitations of Claim 12, Applicant submits that Claim 17 likewise is patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al.

Claim 27 depends indirectly from independent Claim 22 which is recited above. None of Hossack et al., Robinson et al., or Li et al., considered alone or in combination, describe or suggest a computer program as recited in Claim 22. Specifically, none of Hossack et al., Robinson et al., or Li et al., considered alone or in combination, describe or suggest a computer program including a code segment that determines, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Li et al. describe calculating motion factor by comparing at least one current b-mode frame with at least one previous b-mode frame. Accordingly, none of Hossack et al., Robinson et al., or Li et al., considered alone or in combination, describe or suggest a code segment that determines, based on the motion of the array transducer, a delay period as recited in Claim 22. For the reasons set forth above, Claim 22 is submitted to be patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al.

When the recitations of Claim 27 are considered in combination with the recitations of Claim 22, Applicant submits that Claim 27 likewise is patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al.

For at least the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 7, 17, and 27 be withdrawn.

The rejection of Claims 7, 17, and 27 under 35 U.S.C. § 103(a) as being unpatentable over Hossack et al. and further in view of Robinson et al., and further in view of Li et al., and further in view of Tirumalai et al. (U.S. Patent No. 6,872,181) is respectfully traversed.

Hossack, Robinson et al., and Li et al. are described above.

Tirumalai et al. describe a compound image display method. In the method, a plurality of different values for a constant weighting factor m can be utilized for high speed, low speed and very low speed (column 7, lines 25-26). A compounding effect is more reliable where there is high or moderate frame motion speed (column 7, lines 27-28).

Claim 7 depends indirectly from independent Claim 1 which is recited above. None of Hossack et al., Robinson et al., Li et al., or Tirumalai et al., considered alone or in combination, describe or suggest a method of medical ultrasound imaging as recited in Claim 1. Specifically, none of Hossack et al., Robinson et al., or Li et al., or Tirumalai et al., considered alone or in combination, describe or suggest determining, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Li et al. describe calculating motion factor by comparing at least one current b-mode frame with at least one previous b-mode frame. Tirumalai et al. describe utilizing a plurality of different values of a constant weighting factor m for high speed, low speed and very low speed. Accordingly, none of Hossack et al., Robinson et al., or Li et al., or Tirumalai et al., considered alone or in combination, describe or suggest determining, based on the motion of the array transducer, a delay period as recited in Claim 1. For the reasons set forth above, Claim 1 is submitted to be patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al., and further in view of Tirumalai et al.

When the recitations of Claim 7 are considered in combination with the recitations of Claim 1, Applicant submits that Claim 7 likewise is patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al., and further in view of Tirumalai et al.

Claim 17 depends indirectly from independent Claim 12 which is recited above. None of Hossack et al., Robinson et al., Li et al., or Tirumalai et al., considered alone or in combination, describe or suggest a medical ultrasound system as recited in Claim 12. Specifically, none of Hossack et al., Robinson et al., Li et al., or Tirumalai et al., considered alone or in combination, describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Li et al. describe calculating motion factor by comparing at least one current b-mode frame with at least one previous b-mode frame. Tirumalai et al. describe utilizing a plurality of different values of a constant weighting factor m for high speed, low speed and very low speed. Accordingly, none of Hossack et al., Robinson et al., Li et al., or Tirumalai et al., considered alone or in combination, describe or suggest the ultrasound system configured to determine, based on the motion of the array transducer, a delay period as recited in Claim 12. For the reasons set forth above, Claim 12 is submitted to be patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al., and further in view of Tirumalai et al.

When the recitations of Claim 17 are considered in combination with the recitations of Claim 12, Applicant submits that Claim 17 likewise is patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al., and further in view of Tirumalai et al.

Claim 27 depends indirectly from independent Claim 22 which is recited above. None of Hossack et al., Robinson et al., Li et al., or Tirumalai et al., considered alone or in combination, describe or suggest a computer program as recited in Claim

22. Specifically, none of Hossack et al., Robinson et al, Li et al, or Tirumalai et al., considered alone or in combination, describe or suggest a computer program including a code segment that determines, based on the motion of the array transducer, a delay period used before modifying a number of steering frames used to construct the compound image. Rather, Hossack et al. describe eliminating a component image in response to an estimated motion of successive images. Hossack et al. further describe adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. describe increasing a number of look directions when a number of lines simultaneously acquired is increased. Li et al. describe calculating motion factor by comparing at least one current b-mode frame with at least one previous b-mode frame. Tirumalai et al. describe utilizing a plurality of different values of a constant weighting factor m for high speed, low speed and very low speed. Accordingly, none of Hossack et al., Robinson et al, Li et al, or Tirumalai et al., considered alone or in combination, describe or suggest a code segment that determines, based on the motion of the array transducer, a delay period as recited in Claim 22. For the reasons set forth above, Claim 22 is submitted to be patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al., and further in view of Tirumalai et al.

When the recitations of Claim 27 are considered in combination with the recitations of Claim 22, Applicant submits that Claim 27 likewise is patentable over Hossack et al. in view of Robinson et al., and further in view of Li et al., and further in view of Tirumalai et al.

For at least the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 7, 17, and 27 be withdrawn.

In addition to the arguments set forth above, Applicant respectfully submits that the Section 103 rejections of Claims 6, 7, 16, 17, 26, and 27 over Hossack et al. alone is not a proper rejection. As is well established, the mere assertion that it would have been obvious to one of ordinary skill in the art to have modified Hossack et al. to obtain the claimed recitations of the present invention does not support a prima facie obvious rejection. Rather, each allegation of what would have been an obvious matter of design choice must always be supported by citation to some reference work recognized as standard in the pertinent art and the Applicant given the opportunity to

challenge the correctness of the assertion or the notoriety or repute of the cited reference. Applicant has not been provided with the citation to any reference supporting the combination made in the rejection. The rejection, therefore, fails to provide the Applicant with a fair opportunity to respond to the rejection, and fails to provide the Applicant with the opportunity to challenge the correctness of the rejection. Of course, such combinations are impermissible, and for this reason alone, Applicant requests that the Section 103 rejection of Claims 6, 7, 16, 17, 26, and 27 be withdrawn.

Moreover, Applicant respectfully submits that the Section 103 rejections of Claims 1-31 are not proper rejections. As is well established, obviousness cannot be established by combining the teachings of the cited art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination. None of Hossack et al., Robinson et al., Weng, Li et al., or Tirumalai et al., considered alone or in combination, describe or suggest the claimed combination. Furthermore, in contrast to the assertion within the Office Action, Applicant respectfully submits that it would not be obvious to one skilled in the art to combine Hossack et al. with Robinson et al., Weng, Li et al., or Tirumalai et al. because there is no motivation to combine the references suggested in the cited art itself.

As the Federal Circuit has recognized, obviousness is not established merely by combining references having different individual elements of pending claims. Ex parte Levengood, 28 U.S.P.Q.2d 1300 (Bd. Pat. App. & Inter. 1993). MPEP 2143.01. Rather, there must be some suggestion, outside of Applicant's disclosure, in the prior art to combine such references, and a reasonable expectation of success must be both found in the prior art, and not based on Applicant's disclosure. In re Vaeck, 20 U.S.P.Q.2d 1436 (Fed. Cir. 1991). In the present case, neither a suggestion or motivation to combine the prior art disclosures, nor any reasonable expectation of success has been shown.

Furthermore, it is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the cited art so that the claimed invention is rendered obvious. Specifically, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the art to deprecate the claimed invention. Further, it is impermissible to pick and choose from any one

reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. The present Section 103 rejections are based on a combination of teachings selected from multiple patents in an attempt to arrive at the claimed invention. Specifically, Hossack et al. teach eliminating a component image in response to an estimated motion of successive images. Hossack et al. further teach adapting a frequency selection of possible component images within a sequence as a function of estimated motion. Robinson et al. teach increasing a number of look directions when a number of lines simultaneously acquired is increased. Weng teaches applying a plurality of final local motion vectors to a least-squares process to estimate global image motion. Based on the global image motion information, a current image frame is transformed geometrically to coincide with a previously compounded image frame. Li et al. teach calculating motion factor by comparing at least one current b-mode frame with at least one previous b-mode frame. Tirumalai et al. teach utilizing a plurality of different values of a constant weighting factor m for high speed, low speed and very low speed. Since there is no teaching nor suggestion in the cited art for the combination, the Section 103 rejections appear to be based on a hindsight reconstruction in which isolated disclosures have been picked and chosen in an attempt to deprecate the present invention. Of course, such a combination is impermissible, and for this reason alone, Applicant requests that the Section 103 rejections of Claims 1-31 be withdrawn.

For at least the reasons set forth above, Applicant respectfully requests that the rejections of Claims 1-31 under 35 U.S.C. 103(a) be withdrawn.

In view of the foregoing amendment and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,



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